The Collaborative Science, Technology, and Applied Research (CSTAR) Program

3rd NOAA Testbed and Operational Proving Ground Workshop

May 3, 2012

Curtis H. Marshall, Ph.D.

Outline

- ✓ What?
  - Types of awards
  - Mechanics
  - History
- ✓ Who/Where?
  - Current Projects

CSTAR Program

Overview

- ✓ An umbrella program for NWS/university collaborative research consisting of:
  - *Fully competitive, in-house, applied research grant program started in 2000*
    - One to three-year studies--maximum funding level $125K/yr
    - Objective: To improve local NWS forecast and warning services by exploiting S&T improvements to the fullest
    - Applied research and education projects involving collaboration between NWS forecasters and university experts (“grassroots” R2O)
    - Proposals must address national, regional or NCEP-related science needs/priorities

COMET Outreach

- COMET Outreach Program
  - Smaller-scale competitive grant program managed by UCAR/COMET via OST funding and oversight
  - Cooperative Projects: one- to three-year studies of $30-$40K/year
  - Partners Projects: One-year, up to $15K/year
  - Case-study oriented
  - Workshop support

Mechanics

- CSTAR FFO/RFP issued every summer (every 3rd year is an “off year”)
- RFP based on science priorities established with input of SSD Chiefs, NCEP, and others
- Proposals evaluated by team consisting largely of the above
- Announcement of awards around the New Year
- Funding obligated by May 1
- COMET Outreach RFP administered by COMET

CSTAR Benefits

- ✓ Forecast and Warning Improvement
  - Quantitative comparisons demonstrate offices participating in collaborative research projects outperform those that do not (Waldstreicher, 2005)
  - Accelerated transition of research to operations

- ✓ Leveraging Resources
  - Value of engaging world-class researchers, staffs, students at academic institutions far exceeds cost
  - Excellent student recruiting tool for university recipients

CSTAR Benefits

- ✓ As of early Spring 2012, at least 76 CSTAR "alumni" have been subsequently employed by NOAA
- ✓ 3 former PIs
- ✓ Of the 76 students, at least 71 are currently full time NOAA employees
- ✓ 6 SOOs

Current CSTAR Awards

University of Oklahoma

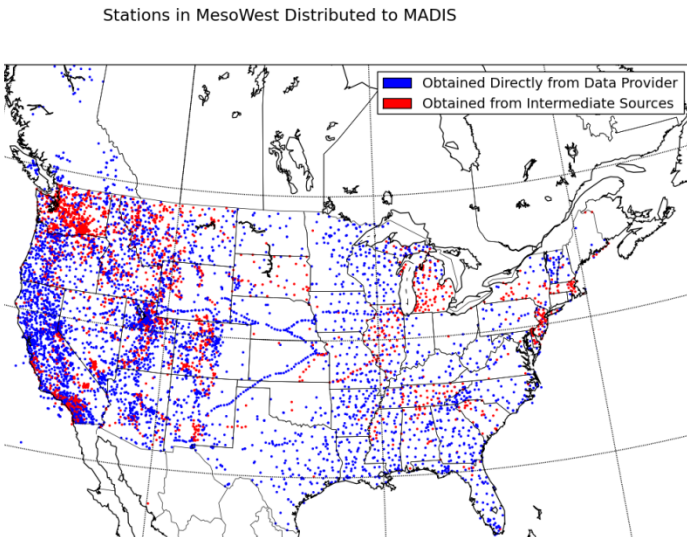
"A Partnership to Develop, Conduct, and Evaluate Realtime Convection-Resolving Probabilistic and Deterministic Forecasts for Convective-scale Hazardous Weather: Moving to the Next Level"

- PIs: Ming Xue, Xuguang Wang, Fanyou Kong, and Keith Brewster
- NWS Collaborating Offices: SPC, AWC, EMC, WFO OUN
- Provide HWT storm-scale ensemble forecasts for demonstrating and evaluating potential future high-resolution, convection-permitting and convection-resolving NWP products.
- Term: 5/1/10 – 4/30/13

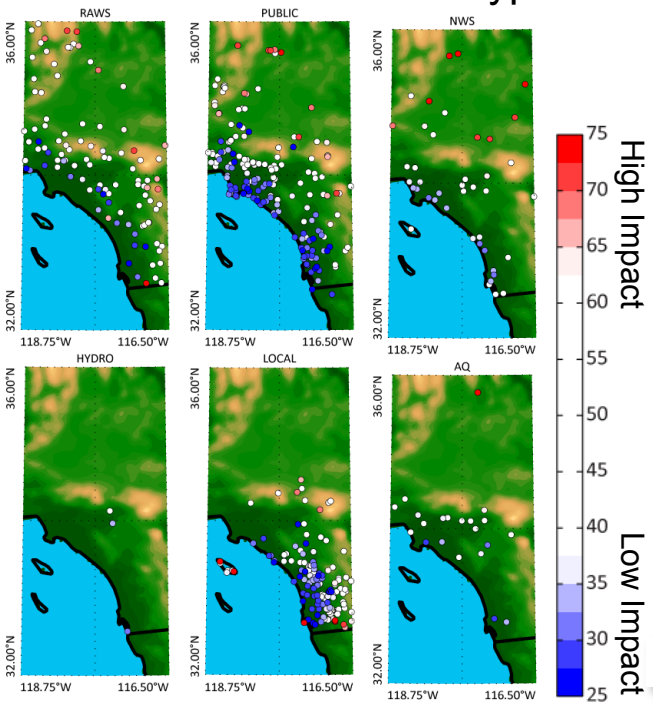
Current CSTAR Awards
University of Utah

Advancing Analysis, Forecast and Warning Capabilities for High Impact Weather Events. PIs: John D. Horel and W. James Steenburgh. NWS Collaborating Offices: Multiple WFOs, WR

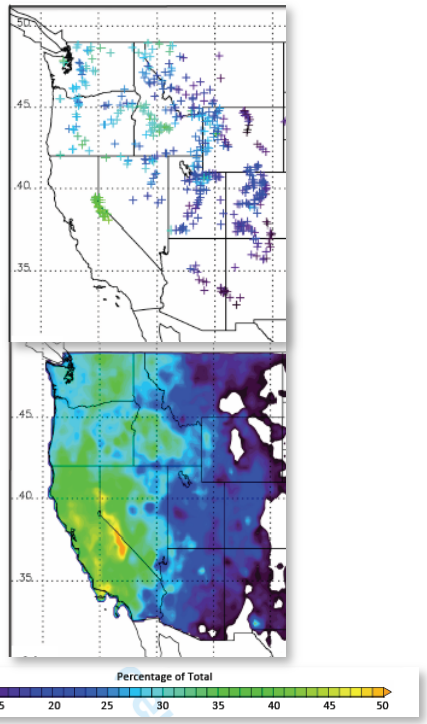
Further improvements to MesoWest (access to new networks & new quality control procedures & data mining tools)



Investigations of impacts of surface observations as a function of network type



Impacts of atmospheric rivers on precipitation in the western U.S.



Current CSTAR Awards

Texas A&M (Galveston)

"Development of an Integrated Wave-Current-Wind Forecasting System for Coo Inlet: Supplementing NCEP's Forecasting Efforts"

- PIs: Vijay Panchang
- NWS Collaborating Offices: WFOs Galveston/Houston, Anchorage, EMC/MMB
- 2-day ocean wave prediction system for Cook Inlet AK using WRF, WAVEWATCH III and SWAN
- Term: 5/1/10 – 4/30/13

Current CSTAR Awards

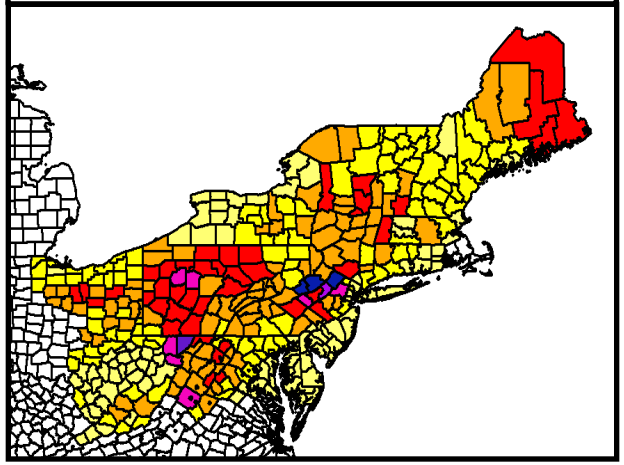
University at Albany, SUNY

Cool- and Warm-Season Precipitation Forecasting over the Eastern U.S.

PIs: Lance Bosart and Dan Keyser; Students: Chris Castellano, Dan Thompson, and Matt Potter

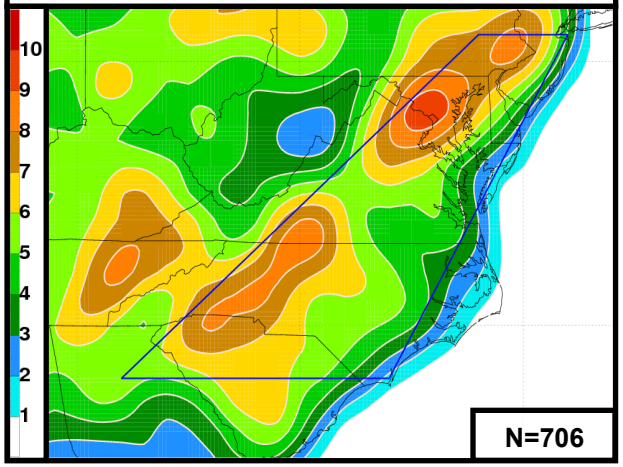
NWS Focal Points: John Quinlan, Kevin Lipton, and Tom Wasula (WFO-ALY); Matt Kramar (WFO-LWX)

Ice storms by county (1993–2010)



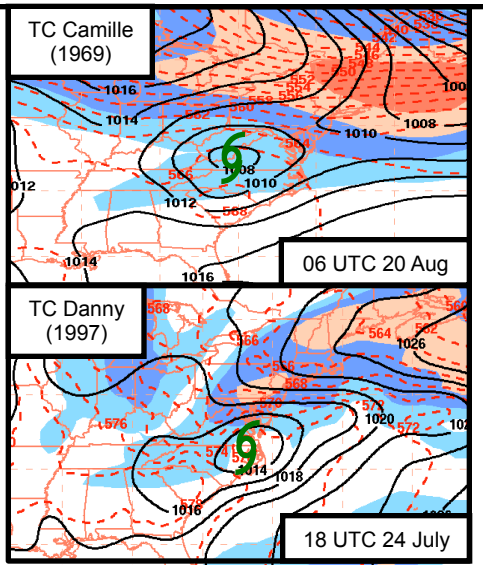
- Ice storms are most frequent over elevated terrain, along prominent mountain ranges, and within protected valleys
- Ice storm occurrence is heavily influenced by synoptic and mesoscale topographic features, as well as proximity to large bodies of water

Percentage of ALT days with at least one storm report (smoothed)



- Appalachian lee trough (ALT) days are associated with higher CAPE and more severe thunderstorm reports than non-ALT days
- Severe thunderstorm reports on ALT days are maximized from southeastern Pennsylvania to northeastern Virginia and from southwestern Virginia to northwestern South Carolina

250-hPa wind speed (shaded, m s^{-1}), 1000–500-hPa thickness (dashed, dam), and MSLP (black, hPa)



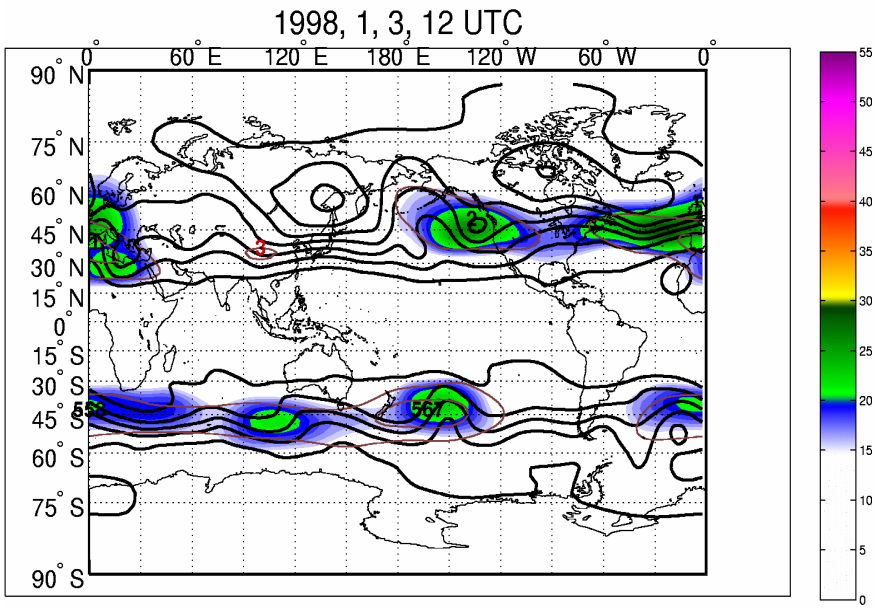
- Inland flooding from TC Camille occurred with lower-tropospheric frontogenesis in a warm, moist environment characterized by upslope flow
- Inland reintensification of TC Danny occurred in a favorable environment for deep, moist ascent near the equatorward entrance region of a 250-hPa jet

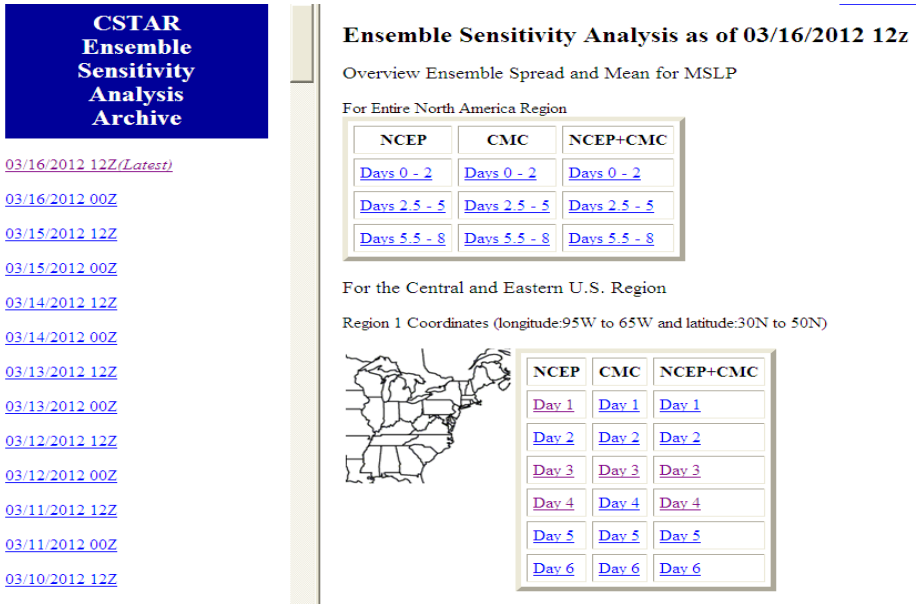
Current CSTAR Awards

SUNY Stony Brook

Predictability of High Impact Weather during the Cool Season over the Eastern U.S

NWS CSTAR Partners: David Novak and Mike Bodner (HPC); Yuejian Zhu, Yan Luo; Jun Du, and Jordan Alpert (EMC); Joseph Sienkiewicz (OPC), Jeff Tongue (WFO-OKX); Al Cope (WFO-PHI); Richard Grumm et al. (WFO-CTP)





- ✓ * Complete a Rossby Wave Packet Climatology and Ensemble Validation Using Automated Tracking.
- ✓ * Test new operational ensemble tools
- ✓ (ALPS, wave packets…) and post-processing (BMA)

- ✓ * Explore the predictability of mesoscale snowbands using multi-model ensembles.
- ✓ * Develop a real-time ensemble sensitivity tool to point forecasters toward important upstream synoptic features.

Current CSTAR Awards

NC State

"Improving Prediction of Severe Winds, Convection, and Heavy Precipitation in the Southeastern United States"

- PIs: Gary Lackmann, Matt Parker, Anantha Aiyyer
- NWS Collaborating Offices: WFOs throughout SE, EMC, SPC, TPC
- Inland wind accompanying tropical cyclones, heavy precipitation and localized flodding associated with TCs, severe convective storms under conditions of marginal instability and strong vertical shear
- Term: 5/1/10 – 4/30/13

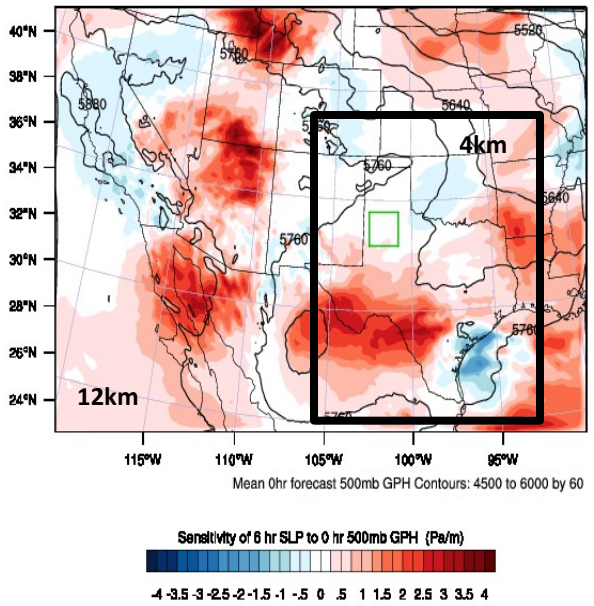
Current CSTAR Awards

Texas Tech University

Integration of Forecast Sensitivity into the NWS Forecasting Process to Improve Predictability of High-impact Weather

NWS CSTAR Partners: The SPC and the WFOs of Lubbock, Amarillo, Corpus Christi, Norman, Dallas/Ft. Worth, Albuquerque, and Austin/San Antonio

Pis: Brian Ancell and Christopher Weiss

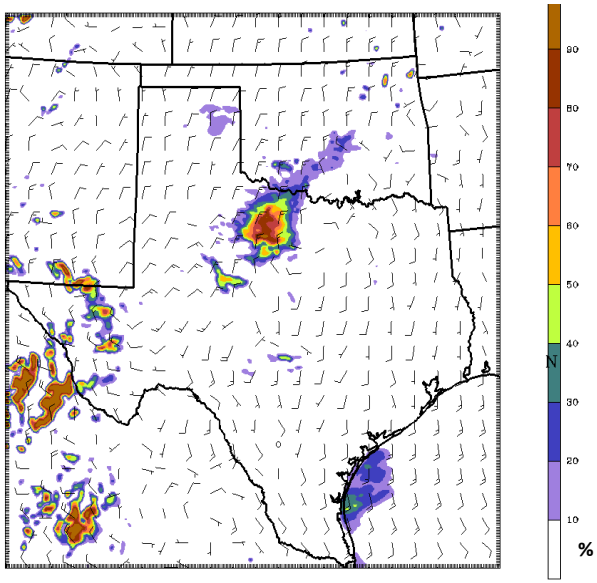


Cross-grid 06-hr Forecast Sensitivity of 4-km Domain SLP in Green Box to 00-hr 12-km Domain 500GPH

Project Goals

1) Development/integration of cross-grid forecast sensitivity of severe convection, winter storms, and flooding into NWS operations

2) Development/forecaster evaluation of high resolution ensemble products using a 12km/4km nested ensemble Kalman filter (EnKF) assimilation/forecasting system



Probability of 10-hr forecast surface wind speed exceeding 20mph with 33-member 4-km EnKF

Current CSTAR Awards

Portland State University

"Towards Objective Multi-Modeling for Multi-Institutional Seasonal Water Supply Forecasting "

- PIs: Hamid Moradkhani
- Collaborating Offices: NWRFC, CBRFC
- Optimally combine the multi-model ensemble hydrologic forecasts usung the Community Hydrologic Prediction System (CHPS) as a framework to incorporate the suite of water supply forecasting models developed over the last three decades.
- Term: 5/1/11 – 4/30/14

COMET OUTREACH
Current Awards

- Approximately 19 ongoing Partners Projects
- 5 ongoing Cooperative Projects
- No OST-overseen RFP for Cooperative projects in recent years due to lack of funds
- However several Cooperative Projects and Partners Projects supported by GOES-R Program Office

THANK YOU

Questions/Comments?

Curtis Marshall

Curtis.Marshall@noaa.gov

(301) 713-3557 x179